

ATENT COOPERATION TREATY

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From the INTERNATIONAL SEARCHING AUTHORITY

To:

OYEN WIGGS GREEN & MUTATA
The Station
480 - 601 West Cordova Street
VANCOUVER, British Columbia
Canada, V6B 1G1

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COMMUNICATION IN CASES FOR WHICH
NO OTHER FORM IS APPLICABLE

OYEN WIGGS
GREEN & MUTATA

Date of mailing
(day/month/year)

11 March 2005 (11-03-2005)

Applicant's or agent's file reference
W274-0208

REPLY DUE

See paragraph 1 below

International application No
PCT/CA2004/001735

International filing date
(day/month/year)

23 September 2004 (23-09-2004)

Applicant WESTPORT RESEARCH INC. ET AL

1. ☐ REPLY DUE within __ months/days from the above date of mailing

☒ NO REPLY DUE

2. COMMUNICATION :

Please find attached a Corrected Version of the International Search Report and Written Opinion. The errors contained in the IPC codes have been corrected. The Office apologizes for any inconvenience this may have caused.

Name and mailing address of the ISA/
Commissioner of Patents
Canadian Patent Office
Box PCT, Ottawa/Gatineau K1A 0C9
Facsimile No. 1-819-953-9538

Authorized officer

Wendy McQuaig (819) 994-3711

PATENT COOPERATION TREATY

CORRECTED VERSION - 10 March 2005

PCT

INTERNATIONAL SEARCH REPORT (PCT Article 18 and Rules 43 and 44)

| | | | |
|---|---|--|---|
| Applicant's or agent's file reference W274-0208 | FOR FURTHER ACTION | | see Form PCT/ISA/220 as well as, where applicable, item 5 below. |
| International application No. PCT/CA2004/001735 | International filing date (<i>day/month/year</i>) 23 September 2004 (23-09-2004) | (Earliest) Priority date (<i>day/month/year</i>) 23 September 2003 (23-09-2003) | |
| Applicant WESTPORT RESEARCH INC. ET AL | | | |
| This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau. | | | |
| <p>This international search report consists of a total of <u>3</u> sheets.</p> <p><input checked="" type="checkbox"/> It is also accompanied by a copy of each prior art document cited in this report.</p> <p>1. Basis of the report</p> <p style="margin-left: 20px;">a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.</p> <p style="margin-left: 40px;"><input type="checkbox"/> the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).</p> <p style="margin-left: 20px;">b. <input type="checkbox"/> With regard to any nucleotide and/or amino acid sequence disclosed in the international application, see Box No. I</p> <p>2. <input type="checkbox"/> Certain claims were found unsearchable (See Box II).</p> <p>3. <input type="checkbox"/> Unity of invention is lacking (See Box III).</p> <p>4. With regard to the title.</p> <p style="margin-left: 20px;"><input checked="" type="checkbox"/> the text is approved as submitted by the applicant.</p> <p style="margin-left: 20px;"><input type="checkbox"/> the text has been established by this Authority to read as follows :</p> <p>5. With regard to the abstract.</p> <p style="margin-left: 20px;"><input checked="" type="checkbox"/> the text is approved as submitted by the applicant.</p> <p style="margin-left: 20px;"><input type="checkbox"/> the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.</p> <p>6. With regard to the drawings,</p> <p style="margin-left: 20px;">a. The figure of the drawings to be published with the abstract is Figure No.:</p> <p style="margin-left: 40px;"><input checked="" type="checkbox"/> as suggested by the applicant.</p> <p style="margin-left: 40px;"><input type="checkbox"/> As selected by this authority, because the applicant failed to suggest a figure.</p> <p style="margin-left: 40px;"><input type="checkbox"/> As selected by this Authority, because this figure better characterizes the invention.</p> <p style="margin-left: 20px;">b. <input type="checkbox"/> None of the figures is to be published with the abstract.</p> | | | |

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2004/001735

A. CLASSIFICATION OF SUBJECT MATTER

IPC7 F02D 41/30; F02D 41/38, F02D 28/00, F02B 1/06, F02B1/08

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7 F02D 42/30, F02B 1/06

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base, and, where practicable, search terms used)

USPTO Full-Text and Image Database; Delphion; Canadian Database; Espacenet
Search terms such as: "Simulation", "injection", "cylinder pressure", "torque", "converged cylinder pressure", "converged intake flow"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|----------|--|-----------------------|
| A | D1: EP 0 877 309 B1 (CHENG) 2000-06-21 (21-06-2000) | 1-46 |
| A | D2: US 6 286 482 (FLINN) September 11, 2001 (11-09-2001) | 1-46 |

Further documents are listed in the continuation of Box C.

Patent family members are listed in annex.

* Special categories of cited documents :
 "A" document defining the general state of the art which is not considered to be of particular relevance
 "E" earlier application or patent but published on or after the international filing date
 "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
 "O" document referring to an oral disclosure, use, exhibition or other means
 "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
 "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
 "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
 "&" document member of the same patent family

Date of the actual completion of the international-type search
19 November 2004 (19-11-2004)

Date of mailing of the international-type search report
21 February 2005 (21-02-2005)

Name and mailing address of the ISA/CA
 Commissioner of Patents
 Canadian Patent Office - PCT
 Ottawa/Gatineau KIA 0C9
 Facsimile No. 1-819-953-9358

Authorized officer
 Arvo Taagepera (819) 997-3089

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CA2004/001735

| Patent Document Cited in Search Report | Publication Date | Patent Family Member(s) | Publication Date |
|---|---------------------|----------------------------|---------------------|
| EP0877309 | 11-11-1998 | DE69800186D D1 | 27-07-2000 |
| | | DE69800186T T2 | 09-11-2000 |
| | | EP0877309 A1 | 11-11-1998 |
| | | US6236908 B1 | 22-05-2001 |
| <hr/> | | | |
| US6286482 | 11-09-2001 | AU4082997 A | 26-03-1998 |
| | | AU4158097 A | 06-03-1998 |
| | | CN1233313 A | 27-10-1999 |
| | | EP0928369 A1 | 14-07-1999 |
| | | JP2000514526T T | 31-10-2000 |
| | | US6230683 B1 | 15-05-2001 |
| | | US6286482 B1 | 11-09-2001 |
| | | US2001017127 A1 | 30-08-2001 |
| | | US2002026926 A1 | 07-03-2002 |
| | | US2002185109 A1 | 12-12-2002 |
| | | US2003200955 A1 | 30-10-2003 |
| | | US2004103860 A1 | 03-06-2004 |
| | | WO9807973 A1 | 26-02-1998 |
| | | WO9810179 A2 | 12-03-1998 |

PATENT COOPERATION TREATY

CORRECTED VERSION - 10 March 2005

From the INTERNATIONAL SEARCHING AUTHORITY

To:
OYEN WIGGS GREEN & MUTALA
The Station
480 - 601 West Cordova Street
VANCOUVER, British Columbia
Canada, V6B 1G1

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WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

| | |
|--------------------------------------|-------------------------------|
| Date of mailing (date/month/year) | 21 February 2005 (21-02-2005) |
|--------------------------------------|-------------------------------|

| | |
|--|---|
| Applicant's or agent's file reference W274-0208 | FOR FURTHER ACTION See paragraph 2 below |
|--|---|

| | | |
|---|---|---|
| International application no PCT/CA2004/001735 | International filing date (date/month/year) 23 September 2004 (23-09-2004) | Priority date (date/month/year) 23 September 2003 (23-09-2003) |
|---|---|---|

International Patent Classification (IPC) or both national classification and IPC
IPC7 F02D 41/30; F02D 41/38, F02D 28/00, F02B 1/06, F02B 1/08

Applicant WESTPORT RESEARCH INC. ET AL

1. This opinion contains indications relating to the following items :

- | | | |
|-------------------------------------|--------------|--|
| <input checked="" type="checkbox"/> | Box No. I | Basis of the opinion |
| <input type="checkbox"/> | Box No. II | Priority |
| <input type="checkbox"/> | Box No. III | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability |
| <input type="checkbox"/> | Box No. IV | Lack of unity of invention |
| <input checked="" type="checkbox"/> | Box No. V | Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/> | Box No. VI | Certain documents cited |
| <input type="checkbox"/> | Box No. VII | Certain defects in the international application |
| <input checked="" type="checkbox"/> | Box No. VIII | Certain observations on the international application |

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

| | |
|---|---|
| Name and mailing address of the ISA/CA Commissioner of Patents Canadian Patent Office Box PCT, Ottawa/Gatineau K1A 0C9 | Authorized officer Arvo Taagepera (819) 997-3089 |
|---|---|

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/CA2004/001735

Box No. I

Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of the international application in the language which it was filed, unless otherwise indicated under this item.

- ☐ This opinion has been established on the basis of a translation from the original language into the following language __, which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).

2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of :

a. type of material

- ☐ a sequence listing
☐ table(s) related to the sequence listing

b. format of material

- ☐ in written format
☐ in computer readable form

c. time of filing/furnishing

- ☐ contained in the international application as filed.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments :

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/CA2004/001735

Box No. V reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | |
|-------------------------------|-------------|-----|
| Novelty (N) | Claims 1-46 | YES |
| | Claims NONE | NO |
| Inventive step (IS) | Claims 1-46 | YES |
| | Claims NONE | NO |
| Industrial applicability (IA) | Claims 1-46 | YES |
| | Claims NONE | NO |

2. Citations and explanations :

Reference is made to the following documents:

D1: EP 0 877 309 B1 (CHENG) 2000-06-21 (21-06-2000)
D2: US 6 286 482 (FLINN) September 11, 2001 (11-09-2001)

The claimed and disclosed invention provides a predictive model for controlling a direct injection internal combustion engine torque, power, fuel consumption and cylinder pressure, by calculating and re-calculating the output parameters.

Broad claim 26 claims a method of predicting output data generated by direct injection internal combustion engine, said output data comprising at least one of engine torque, fuel consumption, power and cylinder pressure, selecting an injector geometry, engine geometry, speed and injector command, estimating initial cylinder pressure and initial intake flow, and calculating converged cylinder pressure and converged intake flow.

Document D1 is considered to represent the most relevant state of the art. D1 discloses virtual vehicle sensor simulation models to monitor engine parameters such as in-cylinder pressure and exhaust gas temperature.

Document D1 does not disclose methods of predicting output data generated by direct injection internal combustion engine, said output data comprising at least one of engine torque, fuel consumption, power and cylinder pressure, selecting an injector geometry, engine geometry, speed and injector command, estimating initial cylinder pressure and initial intake flow, and calculating converged cylinder pressure and converged intake flow.

Document D2 discloses a system for effectively controlling the combustion history by providing an active feedback control of the combustion event parameters such as the cylinder pressure.

Document D2 does not disclose methods of predicting output data generated by direct injection internal combustion engine, said output data comprising at least one of engine torque, fuel consumption, power and cylinder pressure, selecting an injector geometry, engine geometry, speed and injector command, estimating initial cylinder pressure and initial intake flow, and calculating converged cylinder pressure and converged intake flow.

Novelty under Article 33(2)PCT

The subject matter of claims 1-46 is considered to be novel under Article 33(2)PCT.

Inventive step under Article 33(3)PCT

The subject matter of claims 1-46 is considered to have an inventive step under Article 33(3)PCT.

Industrial applicability under Article 33(4)PCT

The subject matter of claims 1-46 is considered to have industrial applicability under Article 33(4)PCT.

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/CA2004/001735

Box No. VIII

Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made :

On page 6 lines 6-7 the expression " ...includes A method is disclosed ..." constitutes unclear syntax. The disclosure therefore contravenes Article 5 of the PCT.